

TITLE

**OPTICAL COMMUNICATION BOARDS INCLUDING POWER
CONTROL FUNCTION AND SYSTEM HAVING THE BOARDS**

CLAIM OF PRIORITY

[0001] This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from an application for *OPTICAL COMMUNICATION BOARD HAVING POWER CONTROL FUNCTION AND SYSTEM HAVING THE BOARD* earlier filed in the Korean Intellectual Property Office on 22 October 2002 and there duly assigned Serial No. 2002-64640.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention generally relates to optical communication boards having a power control function and a system having the boards.

Description of the Related Art

[0003] Recently, as the Internet and data for communication have been widely used, high capacity optical modules for optical communication have become very important in a communication system. Thus, if the optical modules are damaged, a considerable amount of data loss and a communication

1 failure will cause entire industrial loss.

2 [0004] As a result, a method for maintaining performance of the optical modules has been
3 developing.

4 [0005] Particularly, it is essential to satisfy various requirements in order to regularly supply
5 power necessary for the optical modules and normally operate the optical modules.

6 [0006] Optical communication boards are mounted on system racks. Optical communication
7 boards are mounted according to functions necessary for various system racks. The optical
8 communication boards are composed of optical modules and power converters applied with system
9 power to convert the applied power into power necessary for the optical modules and apply the
10 power to the optical modules.

11 [0007] Like the above, if the optical communication boards are mounted on one system, the same
12 power is applied by rack units, and the power is converted into power necessary for each module by
13 the power converters installed in each optical communication board, then the power is supplied to
14 each module.

15 [0008] When the system power is applied while the optical communication boards are mounted
16 on the system, a power flow chart up to the optical modules will be described as follows.

17 [0009] First, when the system power is on, power is applied to the system. The power applied to
18 the system is applied to each optical communication board. The system power applied to the optical
19 communication boards is converted into necessary power by each power converter, and the converted
20 power by the power converters is applied to each optical module.

21 [0010] In the meantime, when an optional optical communication board is mounted on the system

1 after applying the system power, a power flow chart up to the optical modules will be described as
2 follows. The same power with rack units is already supplied before mounting each optical
3 communication board. When the optical communication boards are mounted, the converted power
4 is applied to the optical modules of the optical communication boards simultaneously.

5 **[0011]** In such a case of the earlier art, since power is already supplied to the entire racks before
6 mounting the optical communication boards on the racks, power is applied to each module of the
7 optical communication boards at the same time when the optical communication boards are
8 mounted. Thus, the optical modules for optical communication can be damaged by an electric shock
9 due to sudden power applying, and a high voltage current can damage the modules when the optical
10 modules are not normally operated.

11 SUMMARY OF THE INVENTION

12 **[0012]** It is therefore an object of the present invention to provide optical communication boards
13 having a power control function and a system having the boards for maintaining performance of
14 optical modules by preventing the optical modules for optical communication from being damaged
15 owing to an electric shock or differences from normal operation requirements caused when power
16 is applied to each optical module of the optical communication boards, as soon as the optical
17 communication boards are mounted when power is supplied to entire racks.

18 **[0013]** It is another object to provide stable power to optical communication modules when a
19 power applying control signal is generated by a remote controller.

20 **[0014]** It is yet another object to efficiently prevent optical modules for optical communication

1 from being electrically damaged from sudden application of power.

2 **[0015]** To accomplish the above and other objects, according to one aspect of the present
3 invention, the present invention provides optical communication boards detachably mounted on
4 racks of an optional optical communication system. The optical communication boards include:
5 optical modules for performing optical communication; a plurality of power converters converting
6 the system power into necessary power to be supplied to the optical modules; and a power controller
7 performing a switching process to supply the power supplied through the power converters to the
8 optical modules according to a power supplying control signal supplied through the racks of the
9 optical communication system, while preventing the power supplied from the power converters from
10 being supplied to the optical modules when mounted on the racks of the optical communication
11 system.

12 **[0016]** In addition, according to another aspect of the present invention, an optical communication
13 system includes: racks mounting optional boards, and supplying system power to the mounted
14 boards; a remote control line supplying a power supplying control signal to the optional boards
15 mounted on the racks; optical communication boards having optical modules, receiving the system
16 power by being mounted on the racks, and selectively supplying the supplied system power to the
17 optical modules according to the power supplying control signal supplied through the remote control
18 line; and a remote controller outputting the power supplying control signal to the optical
19 communication boards through the remote control line in order to prevent the system power from
20 being supplied to the optical modules when the optical communication boards are mounted on the
21 racks while the system power is applied to the racks, and to supply the power to the corresponding

1 optical modules when the system power is stable at predetermined level by being applied to the
2 optical communication boards.

3 BRIEF DESCRIPTION OF THE DRAWINGS

4 [0017] A more complete appreciation of the invention, and many of the attendant advantages
5 thereof, will be readily apparent as the same becomes better understood by reference to the following
6 detailed description when considered in conjunction with the accompanying drawings in which like
7 reference symbols indicate the same or similar components, wherein:

8 [0018] Fig. 1 is a diagram illustrating optional racks mounting many boards thereon in a prior
9 optical communication system;

10 [0019] Fig. 2 is an internal format block diagram of optical communication boards mounted on
11 the racks of Fig. 1;

12 [0020] Fig. 3 is a format block diagram of an optical communication system in accordance with
13 one aspect of the present invention;

14 [0021] Fig. 4 is an internal format block diagram of optical communication boards mounted on
15 the racks of Fig. 3;

16 [0022] Fig. 5 is an internal format block diagram of a power controller of Fig. 4; and

17 [0023] Fig. 6 is a power flow chart up to optical modules when system power is applied while
18 optical communication boards in accordance with the present invention are mounted on a system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] Turning now to the drawings, Fig. 1 illustrates that optical communication boards are mounted on system racks. As shown in Fig. 1, optical communication boards (1) are mounted according to functions necessary for various system racks. Fig. 2 is an internal format diagram of the optical communication boards illustrated in Fig. 1. Referring to Fig. 2, the optical communication boards are composed of optical modules (1a) and power converters (1b) applied with system power to convert the applied power into power necessary for the optical modules (1a) and apply the converted power to the optical modules (1a).

[0025] Like above, if the optical communication boards are mounted on one system, the same power is applied by rack units, and the power is converted into power (power 1, power 2 and power 3, power 4) necessary for each module (OTX, ORX) (1a) by the power converters (1b) installed in each optical communication board (1), then the power is supplied to each module (1a).

[0026] When the system power is applied while the optical communication boards (1) are mounted on the system, a power flow chart up to the optical modules will be described as follows.

[0027] First, when the system power is on, power is applied to the system. The power applied to the system is applied to each optical communication board (1). The system power applied to the optical communication boards (1) is converted into necessary power by each power converter (1b), and the converted power by the power converters (1b) is applied to each optical module (1a).

[0028] In the meantime, when an optional optical communication board is mounted on the system after applying the system power, a power flow chart up to the optical modules will be described as follows. The same power with rack units is already supplied before mounting each optical

1 communication board. When the optical communication boards (1) are mounted, the converted
2 power is applied to the optical modules(1a) of the optical communication boards (1) simultaneously.

3 **[0029]** In such a case of the earlier art, since power is already supplied to the entire racks before
4 mounting the optical communication boards on the racks, power is applied to each module of the
5 optical communication boards at the same time when the optical communication boards are
6 mounted. Thus, the optical modules for optical communication can be damaged by an electric shock
7 due to sudden power applying, and a high voltage current can damage the modules when the optical
8 modules are not normally operated.

9 **[0030]** The present invention will now be described more fully hereinafter with reference to the
10 accompanying drawings, in which preferred embodiments of the invention are shown. This invention
11 may, however, be embodied in different forms and should not be construed as limited to the
12 embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will
13 be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.
14 In the drawings, the thickness of layers and regions are exaggerated for clarity. It will also be
15 understood that when a layer is referred to as being "on" another layer or substrate, it can be directly
16 on the other layer or substrate or intervention layers may be also be present. Moreover, each
17 embodiment described and illustrated herein includes its complementary conductivity type
18 embodiment as well.

19 **[0031]** Hereinafter, the present invention will be described in detail in reference to the
20 accompanying drawings.

21 **[0032]** Fig. 3 is a format diagram of an optical communication system in accordance with one

1 aspect of the present invention.

2 **[0033]** Referring to Fig. 3, the optical communication system by the one aspect of the present
3 invention includes a remote controller (10), optical communication boards (20), racks (30) mounting
4 the optical communication boards (20) on the system, and a remote control line (40) supplying a
5 power supplying control signal to the optical communication boards (20).

6 **[0034]** The remote controller (10) prevents system power from being supplied to optical modules
7 when the optical communication boards (20) are mounted on the racks (30) while the system power
8 is applied to the racks (30), and outputs the power supplying control signal to the optical
9 communication boards (20) through the remote control line (40) in order to supply the power to the
10 corresponding optical modules while the system power is stable at predetermined level by being
11 applied to the optical communication boards (20). The remote controller (10) can be implemented
12 by a control PC (personal computer) of an operator (operator control terminal).

13 **[0035]** The optical communication boards(20) having the optical modules receive the system
14 power by being mounted on the racks, and selectively supply the supplied system power to the
15 optical modules according to the power supplying control signal supplied through the remote control
16 line (40).

17 **[0036]** The racks (30) mount the optical communication boards (20) having the optical modules
18 thereon, and supply the system power to the mounted optical communication boards (20).

19 **[0037]** The remote control line (40) supplies the power supplying control signal to the optical
20 communication boards (20) mounted on the optional racks (30). That is, the remote controller (10)
21 is interfaced with the optical communication boards (20) mounted on the racks to transmit the

1 control signal. To do this, remote control line terminals for connecting the remote control line (40)
2 should be installed on the racks.

3 **[0038]** Fig. 4 is an internal format diagram of the optical communication boards (20) mounted on
4 the racks (30) of Fig. 3.

5 **[0039]** Referring to Fig. 4, the optical communication boards (20) include: optical modules (21)
6 for performing optical communication; many power converters (22) receiving system power, and
7 converting the system power necessary power to be supplied to the optical modules (21); and a
8 power controller (23) performing a switching process to supply the power supplied through the
9 power converters (22) to the optical modules (21) according to a power supplying control signal
10 supplied through the racks (30) of an optical communication system, while preventing the power
11 supplied from the power converters (22) from being supplied to the optical modules (21) when
12 mounted on the racks of the optical communication system.

13 **[0040]** As system power -48V (volts) is applied, the power converters(22) convert the system
14 power into power necessary for the optical modules(21). For instance, there are 5V, 3.3V, 15V, and
15 8V power.

16 **[0041]** The power controller (23) selectively applies the power converted by the power converters
17 (22) to the optical modules (21). In another words, when the optical communication boards (20) are
18 mounted on the racks (30), the power controller prevents the power from being applied, and when
19 the power converted by the power converters (22) is stable at a predetermined level, the power
20 controller applies the corresponding power at last if a power applying control signal is received from
21 a remote controller (10).

[0042] If the optical communication boards are mounted on the racks (30) of the system while power is supplied to the entire racks, the power is applied to each power converter (22) at the same time. The power converted by the power converters (22) is applied up to the power controller (23). At this time, the converted power 1, 2, 3, and 4 are not applied to the optical modules (21, OTX, ORX) of the optical communication boards (20) mounted on the system. Meanwhile, when the power applying control signal is transmitted to the optical modules 'OTX' and 'ORX' from the remote controller (10), the power 1, 2, 3, and 4 are applied to the optical modules (21) at last.

[0043] When dismounting optical communication boards while operating the system, the above operation is inversely performed.

[0044] Fig. 5 is an internal format block diagram of the power controller of Fig. 4.

[0045] As described in Fig. 5, the power controller (23) includes: a switching unit (23a) performing a switching process to selectively supply power supplied from each power converter (22) to optical modules (21); and a communication controller(23b) performing communication with a remote controller(10) through a remote control line(40), and supplying a switching control signal for controlling opening/closing of the switching unit(23a) to the switching unit(23a).

[0046] The switching unit (23a) can be implemented by an ASIC (Application Specific Integrated Circuit). For example, it can be implemented with the use of many AND gates as shown in Fig. 5. In such a case, when a high signal is inputted from the power converters (22), corresponding power is transmitted to the optical modules (21) if a control value inputted through the communication controller (23b) is high. However, if the control value is low, the power is not supplied to the optical modules (21).

1 [0047] The communication controller(23b) converts a serial signal for remote control transmitted
2 through the remote control line(40) into a parallel signal by using RS-232C protocol, and transmits
3 the parallel signal to the switching unit(23a) composed of the ASIC.

4 [0048] Fig. 6 is a power flow chart up to optical modules when system power is applied while
5 optical communication boards in accordance with the present invention are mounted on a system.

6 [0049] Referring to Fig. 6, when the system power is turned on as described (S1), the system
7 power is applied to each optical communication board mounted on the system (S2). The power is
8 converted into necessary power by corresponding power converters according to each optical
9 communication board(S3). In the meantime, it is decided whether a control signal for supplying
10 power to the optical modules is received from an operator control terminal (S4). If the control signal
11 is received, the converted power is applied to the corresponding optical modules (S5).

12 [0050] On the other hand, a power flow chart up to the optical modules when each board is
13 mounted on the system while the system power is turned on will be described as follows. Optional
14 optical communication boards (20) are mounted on racks (30) between the step1 (S1) and the step2
15 (S2) in Fig. 6. If the optional optical communication boards (20) are mounted while the power is
16 applied to the system, the system power is applied to each optical communication board (20), and
17 is converted into necessary power by power converters (22) installed in each optical communication
18 board (20). If a power control signal for supplying power to the optical modules (21) is received
19 while the power is converted into the necessary power in the power converters (22), the converted
20 power is applied to the optical modules (21) at last.

21 [0051] According to the present invention, when optional optical communication boards are

1 mounted on racks of a system, though system power is applied to the optical communication boards,
2 power converted by power converters installed in the optical communication boards is partially cut
3 off by a power controller, and a stable power is applied to the optical communication modules when
4 a power applying control signal is generated by a remote controller. Therefore, it can prevent the
5 optical modules for optical communication from being damaged owing to an electric shock caused
6 by sudden power applying.